

What is claimed is:

1. A pathogen detection system, the system comprising:
an immunocapture chamber integrated on a microfluidic device, the immunocapture chamber operable to capture a target provided to the
5 immunocapture chamber through a microfluidic channel;
a DNA analysis mechanism associated with the immunocapture chamber, the DNA analysis mechanism integrated on the microfluidic device, the DNA analysis mechanism operable to perform DNA analysis on the target.
2. The pathogen detection system of claim 1, wherein the DNA analysis
10 mechanism comprises PCR and CE.
3. The pathogen detection system of claim 2, wherein PCR is included in a chamber separate from the immunocapture chamber.
4. The pathogen detection system of claim 2, wherein PCR is included in the immunocapture chamber.
- 15 5. The pathogen detection system of claim 2, wherein the chamber for PCR is used for amplification of DNA obtained from lysing the target of interest.
6. The pathogen detection system of claim 3, further comprising an etched capillary electrophoresis microchannel for separation and detection of PCR amplicons.
- 20 7. The pathogen detection system of claim 6, further comprising DNA preconcentration and clean-up chambers for purification of released pathogen genomic DNA or for desalting and preconcentration of amplified DNA before injection onto the CE microchannel.
8. A pathogen detection system, the system comprising:
25 immunocapture means integrated on a microfluidic device, the immunocapture means operable to capture a target provided through a microfluidic channel;
DNA analysis means associated with the immunocapture means, the DNA analysis means integrated on the microfluidic device, the DNA analysis means
30 operable to perform DNA analysis on the target.
9. The pathogen detection system of claim 8, wherein the DNA analysis means comprises a PCR chamber separate from the immunocapture means.

10. The pathogen detection system of claim 9, wherein the PCR chamber is used for amplification of DNA obtained from lysing the target of interest.

11. A pathogen detection system on a monolithic device, the system comprising:

5 a plurality of immunocapture chambers integrated on the monolithic device, the immunocapture chambers operable to capture a target provided to the immunocapture chambers through microfluidic channels;

a plurality of DNA analysis mechanisms associated with the immunocapture chambers, the plurality of DNA analysis mechanisms integrated on the monolithic
10 device, the plurality of DNA analysis mechanisms operable to perform DNA analysis on the target.

12. The pathogen detection system of claim 11, wherein the plurality of DNA analysis mechanisms comprise PCR and CE.

13. The pathogen detection system of claim 11, wherein PCR is performed
15 in chambers separate from the plurality of immunocapture chambers.

14. The pathogen detection system of claim 13, further comprising a plurality of etched capillary electrophoresis microchannels for separation and detection of PCR amplicons.

15. The pathogen detection system of claim 14, further comprising a
20 plurality of integrated DNA preconcentration and clean-up chambers for purification of released pathogen genomic DNA or for desalting and preconcentration of amplified DNA before injection onto the CE microchannel.

16. The pathogen detection system of claim 11, wherein the immunocapture chambers are further operable to purify and concentrate target.

25 17. The pathogen detection system of claim 11, wherein the plurality of microfabricated immunocapture chambers are configured to hold selected antibodies.

18. The pathogen detection system of claim 17, wherein the selected antibodies are held with beads, frits, sol-gels, gels, or polymer monoliths.

30 19. The pathogen detection system of claim 17, wherein the selected antibodies are held with molded blocks of porous, surface functionalized polymer formed directly within the capture chambers.

20. The pathogen detection system of claim 19, wherein the molded blocks are formed by photo polymerization of a precursor mixture including monomers and porogenic solvents.

21. The pathogen detection system of claim 17, wherein the plurality of immunocapture chambers are configured in a radially parallel manner.

22. The pathogen detection system of claim 21, further comprising ring heaters coupled to the plurality of immunocapture chambers, the ring heaters operable to heat the plurality of immunocapture chambers to release the captured target.

23. The pathogen detection system of claim 17, wherein the plurality of immunocapture chambers are configured on a glass layer.

24. The pathogen detection system of claim 23, wherein the glass layer is coupled to a monolithic membrane layer.

25. The pathogen detection system of claim 23, wherein the glass layer includes a plurality of etched channels, the etched channels operable to provide paths for fluid flow.

26. The pathogen detection system of claim 25, wherein the glass layer and a pneumatic layer sandwich the membrane layer.

27. A method for pathogen analysis, the method comprising:
providing a fluid analyte to a plurality of immunocapture chambers through microfluidic channels integrated on a monolithic device;
capturing a target associated with the fluid analyte at the immunocapture chambers; and

performing DNA analysis on the target using a plurality of DNA analysis mechanisms associated with the plurality of immunocapture chambers, the plurality of DNA analysis mechanisms integrated on the monolithic device.

28. The method of claim 27, wherein the plurality of DNA analysis mechanisms comprise PCR and CE.

29. The method of claim 27, wherein PCR mechanisms are included in chambers separate from the plurality of immunocapture chambers.

30. The method of claim 29, wherein the plurality of DNA analysis mechanisms include PCR chambers for amplification of DNA obtained from lysing the target of interest.

31. The method of claim 29, further comprising a plurality of etched capillary electrophoresis microchannels for separation and detection of PCR amplicons.

32. The method of claim 31, further comprising a plurality of integrated
5 DNA preconcentration and clean-up chambers for purification of released pathogen genomic DNA or for desalting and preconcentration of amplified DNA before injection onto the CE microchannel.

33. The method of claim 27, wherein the immunocapture chambers are further operable to purify and concentrate target.

10 34. The method of claim 27, wherein the plurality of microfabricated immunocapture chambers are configured to hold selected antibodies.

35. The method of claim 34, wherein the selected antibodies are held with beads, sol-gels, gels, or polymer monoliths.

36. The method of claim 34, wherein the selected antibodies are held with
15 molded blocks of porous, surface functionalized polymer formed directly within the capture chambers.

37. An apparatus for detecting pathogens, the apparatus comprising:
means for providing a fluid analyte to a plurality of immunocapture
chambers through microfluidic channels integrated on a monolithic device;
20 means for capturing a target associated with the fluid analyte; and
means for performing DNA analysis on the target using a plurality of DNA
analysis mechanisms associated with the plurality of immunocapture chambers, the
plurality of DNA analysis mechanisms integrated on the monolithic device.